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THE NATURE OF RIGIDITY
AS DETERMINED BY VYGOTSKY TEST PERFORMANCE

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "The nature of rigidity as determined by Vygotsky test performance" submitted by Leonard Leslie Stewin in partial fulfilment of the requirements for the degree of Master of Education.

ABSTRACT

A dichotomy regarding the nature of behavioral rigidity exists in current psychological theory. The assumption that rigidity is a generalized personality factor contrasts the assumption that rigidity is task specific. Large bodies of empirical data have been accumulated in supposition of each theoretical perspective.

The present investigation was designed to examine one aspect of rigidity and its effect on problem-solving behavior. It was hypothesized that no connection exists between rigidity displayed in a social situation and performance of a conceptual task.

Initially, measures of social rigidity were obtained by administering the Gough-Sanford Rigidity Scale to students enrolled in Introductory Educational Psychology. From this population, 90 experimental subjects displaying high, moderate, or low social rigidity as defined by test scores were selected. Subsequently, subjects were administered the Vygotsky Test of Concept Formation and objective measures of conceptual rigidity were obtained from their patterns of performance on this task.

An analysis of variance design was utilized to analyze the data. No significant difference in conceptual rigidity was found among the three experimental groups at the

.05 level of significance. Statistical analysis of the results supported the hypothesis of the study; in terms of the measures employed, subjects did not display social and non-social rigidity in any significant relationship.

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CHAPTER I

INTRODUCTION TO THE STUDY

The purpose of the research was to investigate rigidity, specifically examining whether individuals who were rigid on a measure of social attitudes tended to exhibit the same behavior pattern on a non-social task requiring them to formulate a new concept. The investigation considered two areas of psychological theory and research, concept formation and rigidity studies.

I. BACKGROUND TO THE STUDY

L. S. Vygotsky, in Thought and Language, theorized that conceptual thought was comprised of three developmental phases of several subordinate levels (Vygotsky 1966, p. 59). This assumption was a derivative of extensive investigations conducted by Vygotsky and Sakharov employing an original instrument for the analysis of conceptual thought (Vygotsky 1966, p. 56). This instrument was based on a method of double stimulation whereby " ... two sets of stimuli are presented to the subject, one set as objects of his activity, the other as signs which can serve to organize that activity (Vygotsky 1966, p. 56)."

Since the appearance of Vygotsky's studies, several British and American researchers (Hanfmann-Kasanin, 1937, 1942;

Semeonoff and Laird, 1952; Semeonoff and Trist, 1958) have employed this instrument both clinically and experimentally to measure and analyze concept formation processes.

Several reviews of the Vygotsky Test have been published (Pickford and Pickford, 1943; Rapaport, 1945; Hartman, 1947; Zangwill, 1949). In his review, Rapaport (1945, p. 216) remarked that Vygotsky Test performance was affected by several factors including rigidity and flexibility.

The Vygotsky Test is generally employed in examinations of conceptual processes; few studies have been conducted using this instrument in assessments of rigidity. However, Rapaport's (1945) investigations suggested that certain patterns of Vygotsky Test performance are indicative of rigidity. Penny (1951) introduced an objective scoring system yielding a quantitative measure of this factor in the testing situation.

The construct of rigidity has been subject to numerous inquiries. A review of the literature revealed that two exclusive concepts exist regarding the significance of this aspect of cognitive behavior.

(a) Rigidity is regarded as a general factor of personality influencing numerable features of an individual's performance. Cowen and Thompson (1951, p. 175) concluded that rigidity is a "... general factor in personality organization and functioning." Rokeach, in summarizing his research

stated that

... the rigidity inherent in the ethnocentric person's solution of social problems is not an isolated phenomenon but is rather an aspect of a general rigidity factor which will also manifest itself in the solution of any problem, be it social or non-social (1948, p. 259).

(b) Rigidity is regarded as a specific or field dependent factor, influencing particular situations. Luchins (1949, 1951), Werner (1946), and Applezweig (1954) defined rigidity, not as a general factor of the individual's personality, but as a construct applicable to specific tasks.

II. DEFINITION OF THE PROBLEM

The review of the literature, revealing the theoretical division regarding the nature of conceptual rigidity, initiated the present study. The research was designed to determine whether subjects who are predominantly rigid in their social behavior exhibit rigidity to a higher degree on a conceptual task than subjects whose attitudes indicate low social rigidity.

Social rigidity was measured on the Gough-Sanford Rigidity Scale. A second instrument, the Vygotsky Test of Concept Formation, was utilized to obtain the comparative measure of rigidity on a non-social task.

CHAPTER II

REVIEW OF THE LITERATURE

PART I: THE CONCEPT OF RIGIDITY

The concept of rigidity has long been a source of interest to, and of discord among, psychologists. The major obstacle to universal application of the concept has been disagreement regarding the nature of rigidity; some regard it as a specific and unique factor, others maintain it is a composite involving a number of separate dimensions.

Adequate surveys of the literature pertaining to rigidity have been presented by Werner (1946), Rokeach (1948), Fisher (1949), Cattell (1954), and Leach (1967).

In reviewing the pertinent literature, one finds that the creation of an acceptable definition for rigidity has proven exceedingly difficult, although the term is extensively employed. It is used to describe a wide variety of behavior patterns: perseveration, inability to change habits or sets, inability to make discriminations.

One also finds that two schools of thought regarding rigidity exist in the literature; one school considers rigidity as a "general" personality factor which permeates every sphere of life, the second considers rigidity as a task specific fac-

tor. The evolution of these two diametrically opposed viewpoints, an interesting study in itself, is considered in the following section.

Historical Development of the Rigidity Concept

Brief histories of the development of the concept of rigidity have been given by Chown (1959), and Oliver and Ferguson (1951).

Historically, the rigidity concept stems from the work of Neisser, Gross, Hayman, Wiesma, and the psychologists of the Spearman school. These investigations used the term perseveration. More recently the concept has been elaborated and enriched not only by the followers of Spearman but also by Gestalt oriented psychologists including Wertheimer, Duncker, Lewin, Luchins and many others. These investigators used such terms as "rigidity," "gestaltbinding," "heterogeneous functional fixedness," "mechanization," and the like (Oliver and Ferguson 1951, p. 50).

Although Chown (1959, p. 195) attributed initial use of the term perseveration in psychological literature to Neisser in 1884, no description of this concept was attempted until 1927, in Spearman's investigations of mental inertia. Chown pointed out that recognition of rigidity as a personality constituent can be traced through the work of William James, Thurstone, and various other psychologists up to Frenkel-Brunswick.

A number of Spearman's associates and students became interested in demonstrating experimentally that a perseverative

tendency existed as a pure psychological factor, and that individual variations were related to personality differences. Pinard (1932), Cattell (1935), and others developed batteries of simple perceptual and motor tasks, demanding shifts in activity which apparently measured a perseveration tendency independent of intelligence. Pinard (1932) indicated that unusually high or low perseveration appeared relative to behavior problems in children.

Cattell's (1935) work led to a distinction between "the inertia of mental processes" found when a person is asked to alternate between two practical motor skills, and "disposition rigidity" which operates when a familiar task has to be performed in some new way. Cattell also surmised that disposition rigidity was related to specific personality factors such as submissiveness and lack of character integration.

The concept of rigidity employed by Cattell in his studies was not necessarily identical to that employed by other investigators, but

the use of the same word has high-lighted the search for a link between flexibility of personality and flexibility of change in ideas and habits (Chown 1959, p. 195).

Although the term "rigidity" has been frequently employed, the underlying concept has obviously not been universally defined. Several published investigations indicate that the con-

cepts of rigidity held by their authors may be quite ambiguous. In the following section, various approaches to the concept of rigidity will be considered in illustration of the lack of agreement among researchers in the field.

Definitive Studies of Rigidity

Werner (1946), in a critical review of the literature pertaining to rigidity, pointed out several dichotomies in the field.

First, various authors have made statements contradictory to one another because the concept of rigidity has been defined structurally by some, functionally by others. Second, confusion between the concepts of rigidity and stability (differentiation) has led to equivocal statements. Third, unwarranted generalizations have sometimes been derived from the assumption that rigidity is a uniform rather than a multiform trait (1946, p. 43).

Functional rigidity, in Werner's terminology, referred to the inability of the organism to create a variety of responses, attributable to low phylogenetic position, brain injury, or frustration. Werner (1946, p. 43) interpreted structural rigidity as a "property of mental organization" and protested the authenticity of this definition as it neglected the functional dynamics underlying behavior.

Rather than associating rigidity with stability in personality, Werner indicated that stability was dependent on the availability of a variety of responses to maintain the equili-

brium of the organism. Stability was therefore the antithesis of rigidity rather than its concomitant.

Finally, Werner's studies of feeble-minded children and his distinction of a specific form of rigidity in association with congenital feeble-mindedness, in contrast to the pattern of rigidity displayed by brain injured children, led him to conclude that rigidity was multiform. He consequently discredited Kounin's (1941) contention that rigidity as a function of feeble-mindedness was a unitary construct.

Structural interpretation of rigidity. Werner's first statement was that rigidity was commonly defined either structurally or functionally. He assigned the use of the structural interpretation to the Gestalt school of thought, which regarded rigidity as the degree of separation, or the relative independence, of regions within the personality structure. Thus, Gestalt psychologists concerned themselves with cognitive and disposition types of rigidity.

One of the earlier researchers to investigate the concept of rigidity was J. S. Kounin (1941), a student of Kurt Lewin. Kounin, accepting the Lewinian theory of rigidity, attributed the existence of rigidity to the presence of strong boundaries between mental functions. He hypothesized that, as various boundaries may differ in strength in a specific individual, no correlation could be expected between tests of

rigidity involving different functions. Following his investigations, Kounin concluded that

... any performance which requires a certain degree of communication between neighbouring regions (the degree of communication being inversely proportional to the degree of rigidity) is to such an extent made difficult for the older and/or more feeble-minded individual. As far as these experiments permit one to generalize, the phenomenological nature of the performance is unimportant. The task may be predominantly of a cognitive nature (as in the classification experiments), of a motor nature (as in the card-sorting experiment), or of a "volitional" nature (as in the experiments on satiation and co-satiation). If a task is facilitated by the lack of communication between neighbouring regions, such a task will be more efficiently and accurately performed by an older and/or more feeble-minded individual (as indicated by the "transfer of habit" experiment) (1941, p. 271).

Functional interpretation of rigidity. Followers of the functional definition of rigidity implied the existence of a specific perseveration factor as a personality constituent (Werner 1946, p. 43). As Schaie points out,

the literature shows that investigators of the functional school concentrate mostly upon motor-response types of rigidity, as well as its relation to intelligence and mental inertia (1955, p. 604).

Cattell and Tiner (1949) distinguished between two types of behaviors which had previously been categorized "perseveration." The first type, "process rigidity," consisted of a tendency for a known response to continue in the presense of a new stimulus. The second type, "structural rigidity," was defined as the resistance to change of a habit or personality

trait, although a more "rewarding" response to the new stimulus was possible. Cattell and Tiner suggested that structural rigidity " ... is probably associated with some greater success in plodding performances involving careful imitation (1949, p. 339)." They (1949, p. 322-326) hypothesized that the causes of structural rigidity might be intellectual, motivational, or neurological.

Rigidity associated with abnormal conditions. Rigidity has frequently been examined as a symptom of certain abnormal conditions. Goldstein (1943) distinguished two types of rigidity resulting from organic brain damage. He defined primary rigidity as the inability of the patient to shift from one train of thought to another. Secondary rigidity was defined as the tendency for a patient to make an incorrect response in preference to making no response. This type of rigidity occurred only when the subject was confronted with tasks demanding abstraction rather than those allowing a concrete response.

Werner (1946), working with retardates, distinguished two forms of rigidity. He identified a greater perseverative tendency among brain injured than non-brain injured retarded children. He attributed the abnormal rigidity of the brain injured to disintegration or " ...dissecting wholes into unrelated parts ...(1946, p. 23)," causing the organism to repeat isolated performances. Subnormal rigidity, associated

with feeble-mindedness, appeared " ... to be related predominantly to 'global' behavior, i.e. to perception or action organized as undifferentiated wholes (1946, p. 23)." The feeble-minded individual tended to employ "stereotyped responses" rather than responding to distinct situations. Werner concluded from his investigations that rigidity was multiform.

Although various approaches to the concept of rigidity are found throughout psychological literature, a simple dichotomous structure can be discerned. Guiding all the work done on rigidity is the assumption of either a "general" or "specific" structure of rigidity. This particular controversy gained impetus from a study by Milton Rokeach (1948), who assumed the existence of a general rigidity factor. A large number of studies have since been conducted to verify or disprove this contention; the next section presents a review of the research on this topic.

Research into the Nature of Rigidity

As was mentioned previously, early research studies did not deal with the concept of rigidity, but with perseveration. The greater portion of this research was carried out by British psychologists, primarily under the influence of Spearman (1927). Studies conducted tended to support the existence of a group perseveration factor (Pinard, 1932; Cattell, 1946). The general research design (1930's-1940's) involved devising

a battery of tests, each supposed to measure perseveration, then performing a factor analysis on the results.

The next project of major importance in the field was Rokeach's (1948) study of mental rigidity and ethnocentrism. Strongly influenced by the work of Frenkel-Brunswick, Spearman, and other British researchers on perseveration, Rokeach hypothesized:

- (1) That individuals who are rigid in solving specific social problems (as measured by an attitude scale) also show up as rigid in solving non-social problems.
 - (2) That there is a general rigidity factor
- (1948, p. 260).

Rokeach incorporated the California Ethnocentrism Scale as a measure of prejudice and the Einstellung experiment as a measure of rigidity in a test battery. The results of the study confirmed Rokeach's hypotheses.

Rokeach's conclusions were severely criticized by Abraham Luchins (1949), originator of the Einstellung test. Luchins took noted exception to Rokeach's statement regarding the existence of a general factor of rigidity. Luchins maintained that

... our preliminary experimentation on the measurement of rigidity in a number of situations seems to speak against the postulation of a general rigidity factor (1949, p. 458).

Luchin's critique reiterates Kounin's (1948, p. 158-159) assumption that rigidity in behavior may be the result of any number of factors, or that rigidity is field specific.

Rokeach (1949) conceded that emotional and social implications existed in his test material and agreed that his statement that ethnocentrism implies rigidity was only a premise. However, Rokeach (1949, p. 473) added, concurrent studies by independent researchers tended to confirm his results.

As a result of the controversy between Luchins and Rokeach, several studies relating to the nature of rigidity have been conducted.

Applezweig (1954) carried out a comprehensive investigation involving six measures of rigidity and found no significant correlations between performances on the measures employed.

Applezweig (1954, p. 228) maintained that rigidity existed, not as an independent personality factor, but as a behavioral phenomenon resulting from the presence of certain tendencies within the subject, given expression under particular conditions. A similar conclusion was reached by Baer (1964).

Schaie (1955), employing a battery of rigidity tests, attempted to validate the existence of a generalized rigidity factor. The results did not substantiate the study proposi-

tion, leading Schaie to reject the hypothesis of a single rigidity factor. He concluded that

... behavioral rigidity seems best described by three factors, interpreted as "motor cognitive speed," "personality perceptual rigidity," and "motor cognitive rigidity (Schaie 1955, p. 609)."

Goodstein (1953) conducted an inquiry into the possible relationship of intellectual and social rigidity. Specifically, his hypotheses were:

(1) Persons who are intellectually rigid will have more extreme social attitudes than non-rigid persons.

(2) Persons who are intellectually rigid will have more stable social attitudes than non-rigid persons (Goodstein 1953, p. 346).

Following analysis of the results of his testing, Goodstein (1953, p. 352) concluded that the concept of intellectual rigidity as a "unitary psychological trait" could not be maintained, nor was it "a necessary concomitant of extreme or stable social attitudes." Goodstein's results, in his own words, " ... are in direct contradiction to the conclusions of Rokeach (Goodstein 1953, p. 351)."

Wolpert (1955) proposed to confirm the existence of a general rigidity trait by administering five tests of rigidity to college students. The results of his study tended to contradict his hypothesis; that is, no general or consistent pattern of rigidity was exhibited by his subjects.

French (1955) administered a battery of tests to measure various aspects of rigidity and concluded (1955, p. 116) that there was little evidence supporting the existence of a generalized rigidity trait.

The preceding studies (Luchins, 1949; Goodstein, 1953; Applezweig, 1954; Schaie, 1955; Wolpert, 1955; French, 1955) contradict, to varying degrees, the hypothesis of a general factor of rigidity. The following studies tend to agree with the supposition of Rokeach that rigidity is an entity within personality.

Cowen, Wiener, and Hess (1953) developed an Einstellung test based on the same principles as the water jar test, but taking the form of an alphabet maze. Test material consisted of a square imprinted with 36 letters. The subject was instructed to move from the upper right corner to the lower left corner of the maze, spelling as many words as possible with these moves. Moves could be made in any direction which facilitated completion of a word. When alternate moves were possible, the one requiring fewer boxes was preferred. Cowen, Wiener, and Hess also administered the water jar test. Their subjects were 59 college undergraduates.

The authors found a low but significant correlation between rigidity scores on the two structurally similar tests. As a result they concluded that a generalization of specific

problem-solving rigidity had been demonstrated.

An earlier study by Cowen and Thompson (1951) employed eighth grade children as subjects. On the basis of scores obtained on the water jar test, rigid and flexible groups were distinguished. Children who made mathematical errors or who gave complex solutions to an initial control problem were eliminated, leaving 34 subjects. Significant differences were found between the rigid and flexible groups on the Rorschach, which was interpreted as evidence supporting the existence of a general rigidity factor. However, as Chown stressed in summary,

In this investigation, the subjects were a highly selected group of children who were good at arithmetic. It would not be safe to generalize on the basis of these results as Applezweig's work in 1955 has shown (1959, p. 203).

Although Cowen and Thompson (1951) and Applezweig (1954) utilized test batteries of similar constitution, their conclusions were contradictory.

Schmidt, Fonda, and Wesley (1954), conducted a study in rebuttal of Luchin's statement that problem solving rigidity " ... is not a function of the personality per se, but of particular field conditions (1949, p. 438)." From the statistical analysis performed on the results the authors concluded that " ... the hypothesis is supported that rigidity, as here defined, is a consistent personality trait (Schmidt, Fonda and Wesley 1954, p. 450)."

Rubenowitz (1963) utilized a factor analytic approach to examine several aspects of social rigidity-flexibility. He hypothesized that "... the way a person behaves or thinks in one situation is not an isolated phenomenon within the personality, but rather an aspect of a general fundamental factor (1963, p. 230)." His study confirmed his original hypothesis, leading him to conclude that

In adults, a general factor of flexibility-rigidity can be identified, a factor which accounts for a considerable part of the variance in thinking, attitudes, and displayed behavior (1963, p. 232).

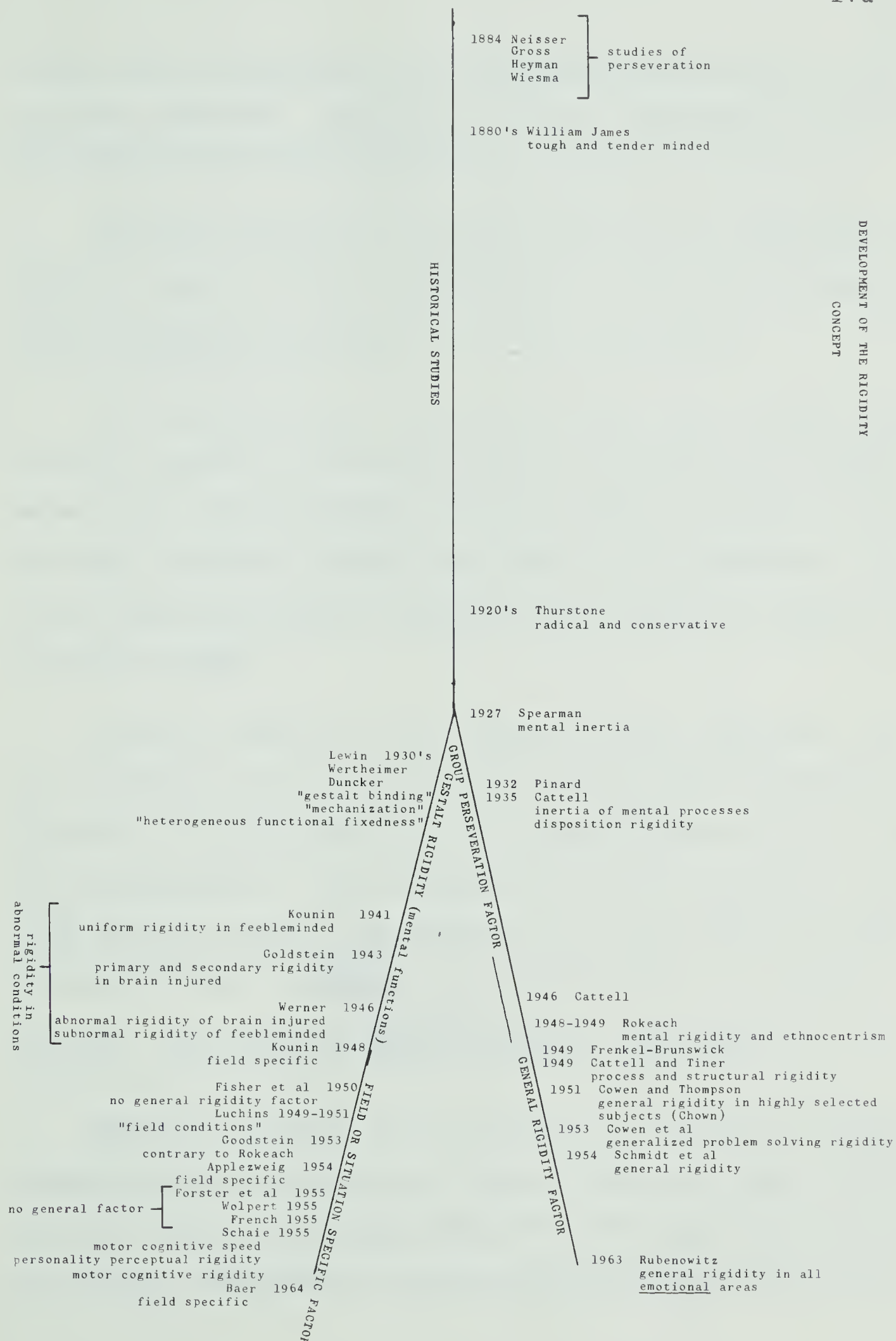
A summary of the development of the rigidity concept, as outlined in the preceding section, is presented in Figure I.

Rubenowitz's words largely substantiate Rokeach's conclusion regarding the nature of rigidity in human personality, however, he deviates emphatically on one major point, that being the transference of social rigidity to non-social behavior areas. In Rubenowitz's words

We agree that many important aspects of cognitive functioning can be attributed to personality rather than to intelligence but we are not inclined to agree when he [Rokeach] includes intellectual problem solving among these aspects. According to our findings a person's ideological orientation may be clearly distinguished from his conceptual behavior in intellectual problem solving when emotions are not involved (1963, p. 237).

Although Rubenowitz concluded that the existence of a rigidity entity had been demonstrated, he contended that its influence was restricted to the affective areas of the individual's life, such as attitudes, in contradiction of Rokeach's

FIGURE 1
DEVELOPMENT OF THE RIGIDITY
CONCEPT



claim that this general trait influenced every sphere of the person's existence. Rubenowitz clearly distinguished between the intellectual and emotional determinants of behavior.

Problem solving is an integral part of all human activity; thus the nature of the relationship, if one exists, between rigidity and problem solving is of great importance.

If a general factor of rigidity does exist, people who are rigid in regard to attitudes should also perform in a rigid manner on a task (problem) requiring them to formulate a new concept. Likewise, people who exhibit low attitudinal rigidity should also appear flexible when required to solve a conceptual problem.

Concept formation is an expansive field; therefore, for the purposes of the current review, only studies specifically related to the Vygotsky Test of Concept Formation will be given consideration. Some attention will also be given to the work done by Vygotsky and Sakharov, to illustrate the significance of their contributions to this sphere of research.

PART II: THE VYGOTSKY MODEL OF CONCEPT FORMATION

Extensive reviews of the literature relating to concept formation have been given by Vinacke (1951) and Pikas (1965). As this study is concerned explicitly with Vygotsky's approach to concept development, the ensuing presentation will be ori-

ented to the interpretation of this theory.

Conception of the Vygotsky Model

Lev Semenovich Vygotsky (1896-1934), Soviet psychological theorist, is noted for his investigations in developmental psychology, education, and psychopathology, and his theory of the development of human mental functions.

In terms of our own intellectual perspective, Vygotsky's views can be labeled superficially as functionalism or instrumentalism, or possibly as like Act Psychology. From the Marxist ideological perspective, he is celebrated as the man who recognized the historical determination of man's consciousness and intellect. But looking at Vygotsky's place in world psychology, his position transcends either the usual functionalism of the Dewey-James variety or the conventional historical materialism of Marxist ideology. Vygotsky is an original (Bruner in Vygotsky 1966, p. vi).

Vygotsky is known in Western psychology as the creator of the Vygotsky Test, based on his "... conception of intelligence as a capacity to benefit from instruction and his ... proposal that we test intelligence accordingly (Bruner in Vygotsky 1966, p. viii)."

During his ten productive years as a psychologist (1924-1934), Vygotsky observed that two major groups of researchers were examining concept formation, each associated with a distinctive research design. One group investigated the content or characteristics of concepts at different stages of development. Experimenters favoring this approach employed de-

inition tests, since concepts were investigated through verbal definitions of their contents. The second major group was concerned primarily with the psychic processes involved in concept formulation. Experiments developed to advance this mode of thought required the subject to discover " ... some common trait in a series of discrete impressions, abstracting it from all the other traits with which it is perceptually fused (Vygotsky 1966, p. 53). "

Vygotsky suggested that either method provided limited information on the true nature of conceptualization and that an inclusive method was required in this research area. Vygotsky shifted his attention to the studies of concept formation being conducted by Ach (Vygotsky 1966, p. 53), which allowed the experimenter to examine the mental processes by which a concept was formulated. Ach's method consisted of confronting the subject with a number of objects (geometric solids) and nonsense words. The subject's task was to discover, through demonstration and manipulation, which nonsense words referred to specific combinations of characteristics of the objects. Thus the nonsense words described, for the subject, types of objects. Prerequisite to successful completion of the task, the subject formulated new concepts. Vygotsky concluded that Ach's studies demonstrated concept formation as a creative process rather than a passive mechanical one based on associative connections.

Vygotsky believed that Ach had neglected a crucial point in studying concept development, namely the significance of signs (words). He referred to Uznadze*, particularly to his conclusion that "... words take over the function of concepts and serve as a means of communication long before they [words] reach the level of concepts characteristic of fully developed thought (Vygotsky 1966, p. 55). Thus, in Vygotsky's and Uznadze's views of concept formation, the word is of central importance, initially as the means for forming a concept, later as the symbol for the concept itself.

The Vygotsky Test of Concept Formation

L. Sakharov, one of Vygotsky's co-workers, was most impressed with Ach's test instrument, which consisted of a set of geometric solids and nonsense words. Vygotsky and Sakharov introduced a modified version of Ach's instrument into the U. S. S. R. and christened it the "method of double stimulation" as

... two sets of stimuli are presented to the subject, one as objects of the activity solids, the other as signs which can serve to organize that activity [nonsense words] (Vygotsky 1966, p. 56).

Hanfmann's description of the Vygotsky materials and test administration are given in illustration of the traditional approach.

*Uznadze, a contemporary Soviet psychologist

The material used in the concept formation test consists of 22 wooden blocks varying in color, shape, height, and size. There are 5 different colors, 6 different shapes, 2 heights (the tall blocks and the flat blocks), and 2 sizes of the horizontal surface (large and small). On the underside of each figure, which is not seen by the subject, is written one of the four nonsense words: lag, bik, mur, cev. Regardless of color or shape, lag is written on all tall large figures, bik on all flat large figures, mur on the small ones, and cev on the flat small ones. At the beginning of the experiment all blocks, well mixed as to color, size and shape, are scattered on a table in front of the subject The examiner turns up one of the blocks (the "sample"), shows and reads its name to the subject, and asks him to pick out all the blocks which he thinks might belong to the same kind. After the subject has done so ... the examiner turns up one of the "wrongly" selected blocks, shows that this is a block of a different kind, and encourages the subject to continue trying. After each new attempt another of the wrongly placed blocks is turned up. As the number of the turned blocks increases, the subject by degrees obtains a basis for discovering to which characteristics of the blocks the nonsense words refer. As soon as he makes this discovery the ... words ... come to stand for definite kinds of objects (e.g., lag for large tall blocks, bik for large flat ones), and new concepts for which the language provides no names are thus built up. The subject is then able to complete the task of separating the four kinds of blocks indicated by the nonsense words. Thus the use of concepts has a definite functional value for the performance required by this test. Whether the subject actually uses conceptual thinking in trying to solve the problem ... can be inferred from the nature of the groups he builds and from his procedure in building them: Nearly every step in his reasoning is reflected in his manipulations of the blocks. The first attack on the problem; the handling of the sample; the response to correction, the finding of the solution -- all these stages of the experiment provide data that can serve as indicators of the subject's level of thinking (Hanfmann in Vygotsky 1966, p. 56-57).

The Vygotsky Model of Concept Formation

Vygotsky (1966, p. 58) and his associates tested 300 subjects with the instrument which he and Sakharov devised. A wide

range of subjects, including children and adults, normal and disturbed, were examined. This initial study led Vygotsky to abstract these significant findings:

(1) The development of the processes which eventually result in concept formation begins in earliest childhood, but the intellectual functions that in a specific combination form the psychological basis of the process of concept formation ripen, take shape, and develop only at puberty.

(2) Concept formation is the result of a complex activity in which all the basic intellectual functions take part. The process cannot ... be reduced to association, attention, imagery, inference, or determining tendencies. They are all indispensable, but they are insufficient without the use of the sign, or word, as the means by which we direct our mental operations

(3) The investigator must aim to understand the intrinsic bonds between the external tasks and the developmental dynamics, and view concept formation as a function of the adolescent's total social and cultural growth, which affect not only the contents but also the method of his thinking Learning to direct one's own mental processes with the aid of words or signs is an integral part of the process of concept formation (1966, p. 58-59).

Vygotsky concluded that concept development could be divided into three phases, each composed of several stages.

PHASE I, the phase of syncretic images: The child places objects in "unorganized congeries" or heaps (Vygotsky 1966, p. 59). During this phase, "... word meaning denotes nothing more to the child than a vague syncretic conglomeration of individual objects that have somehow or other coalesced into an image in his mind (Vygotsky 1966, p. 59-60)." The child cannot distinguish actual bonds between objects from egocentric or perceptual bonds. The groupings have meaning only to

the child and are subject to immediate revision.

Vygotsky recognized three stages within phase I :

(a) trial and error stage: Groups are created at random on a trial basis.

(b) perceptual stage: Groups are created on the basis of spatial or temporal contiguity.

(c) composite stage: Groups are created on the basis of impressions gained through past (trial or perceptual grouping) experience.

PHASE II, the phase of complexes: The child employs words to refer to "families" of objects rather than specific objects. Vygotsky contends that vestiges of complex thinking persist in the language of adults. "In a complex, the bonds between its components are concrete and factual rather than abstract and logical ... (Vygotsky 1966, p. 61)." Thus a complex is a concrete grouping of objects connected by factual bonds.

Five succeeding types of complexes compose phase II. In ascending complexity they are:

(a) associative complex: The grouping is based on any perceived similarity between the sample block and other blocks.

(b) collection complex: The grouping is based on traits by which blocks differ and consequently complement each other; the association is by contrast, rather than by similarity.

(c) chain complex: The grouping is based on relationships detected between subsequent blocks chosen for place-

ment; discrete impressions form a chain.

(d) diffuse complex: The grouping is based on a fluid characteristic which the subject finds within the blocks. For example, the subject picks out triangles, then trapezoids (triangles with tops cut off), trapezoids lead to squares, squares to hexagons, hexagons to semi-circles, semi-circles to circles. Complexes of this nature become limitless due to the universality of their bonds.

(e) pseudo-concepts: These groupings border upon pure concepts. Vygotsky defined a pseudo-concept as a "... generalization formed in the child's mind, ... psychologically very different from the concept proper (Vygotsky 1966, p. 66)." In forming pseudo-concepts the child is guided by perceptual similarities but has not yet attained the ability to abstract this essence.

Particularly at this level, Vygotsky's method of double stimulation proved advantageous. By setting the subject a task which involved verbalization, Vygotsky was able to ascertain the level of thinking, pseudo-conceptual or conceptual, at which the subject actually functioned.

Complexes establish relationships and bonds which, when organized, produce generalizations. In the complex phase, characteristics are not abstracted from the objects in which they are recognized, distinguishing the complex from conceptual levels.

PHASE III, the phase of conceptual thinking: The subject is able to abstract elements and view them apart from the concrete totality of which they partake. The hierarchy of conceptual thought has three stages :

(a) partial abstraction: Groups are created on the basis of maximal similarities. Some object traits are given preference or, in a sense, abstracted.

(b) potential concepts: Groups are created on the basis of single attributes, either perceptual or functional in derivation.

(c) genuine concepts: Groupings are created on the basis of pure abstraction. The word (sign) ceases to be primarily a vehicle for the forming of a concept and becomes the abstract symbol for the concept itself.

The actual development of a concept in Vygotsky's model (1966, p. 81) stems from two main lines:

(a) complex formation, in which the person unites objects under a common family name.

(b) formation of potential concepts by singling out certain common attributes.

In both processes, language is utilized as both a component and a vehicle whereby genuine concept formation is achieved.

Vygotsky's influence as a theorist and director of research continued past his death in 1934, through the contri-

butions of Luria, Leontiev, and Sakharov.

WESTERN STUDIES UTILIZING THE VYGOTSKY TEST OF CONCEPT FORMATION

The block test, as it subsequently became known in Western psychology, was introduced into the United States by Joseph Kasanin (1944, p. 43) and employed by Kasanin and Eugenia Hanfmann in a series of studies (Hanfmann and Kasanin, 1937, 1941, 1942; Kasanin and Hanfmann, July 1938, December 1938). Hanfmann and Kasanin (1937, p. 526) pointed out that the block test, in proposing a definite task for the subject, varied substantially from instruments employed by Ach and by earlier American experimenters (Hull, 1920; Heidbreder, 1934) in their studies of concept formation.

Studies of Evaluation

In their initial report, Hanfmann and Kasanin (1937) attributed successful test performance to three subject characteristics. First, the subject must consider the blocks as "carriers" of properties rather than as individual entities or, in the authors' words, approach the situation with a "categorical attitude." Second, successful subjects displayed the ability to handle multiple possibilities of choice. The third necessary characteristic was the subject's ability to consider the system as a total entity, enabling him to test general characteristics without forming mutually exclusive

groups. This quality led to the required dual classificatory system. The quantitative results of the initial study were published at a later date (Kasanin and Hanfmann, July 1938).

A second study by Hanfmann and Kasanin involved administration of the block test to 30 schizophrenics in a state hospital and to 45 normals (hospital attendants). The control group had been matched as closely as possible with the patients on age and educational level. Hanfmann and Kasanin distinguished lower level performances among the schizophrenic subjects, and agreed with Vygotsky that regression to preconceptual thought was a prominent trait in certain schizophrenic cases (Kasanin and Hanfmann, July 1938, p. 48-52). The authors also noted that educational attainment appeared to be relevant to test performance (Hanfmann and Kasanin 1938, p. 41).

Kasanin and Hanfmann (1938) compared the test performance of all available college-educated patients with a control group comprised of graduate students and research workers.

Kasanin and Hanfmann (1938, p. 46) indicated:

- (a) The order of "good performance" appeared as follows--
 - i normals with superior education
 - ii normals with lower education
 - iii schizophrenics with superior education
 - iv schizophrenics with lower education
- (b) Overlapping of scores indicated that every manifes-

tation of preconceptual thinking cannot be attributed to schizophrenic regression.

(c) The diagnostic capacities of the test, as a qualitative indicator of schizophrenic tendencies, were confirmed.

In studies conducted by Hanfmann and Kasanin, consideration of educational attainment supplants attention to actual intellectual level of the subjects. Presumably, the normals were allowed to advance to their educational potential. The schizophrenics, being institutionalized, would have been allowed only limited educational opportunities. Therefore, any common relationship between subject intelligence and educational achievement would have been substantially modified.

Hanfmann (1941), administering the concept formation test to normal adults of superior education, observed that her subjects arrived at the solution by different means. She classified her subjects as displaying:

- (a) a predominantly perceptual approach to the task
- (b) a predominantly conceptual approach to the task

Hanfmann concluded that efficient test solution involved the utilization of both perceptual and conceptual clues. She further suggested that patterns of performance could be termed concordant or discordant, depending upon whether the two processes (perceptual, conceptual) worked in juxtaposition or opposition.

Pursuing the effect of personality characteristics on individual patterns of performance, Hanfmann (June 1940) administered the Rorschach to twenty subjects. She found a relationship between the type of performance on the block test and certain Rorschach scores. Hanfmann suggested that

The concept formation test may prove to be another good instrument for revealing significant personal patterns in approach to problems (1940, p. 515).

Hanfmann and Kasanin's major work, Conceptual Thinking in Schizophrenia, was published in 1942. As the quantitative results of their work had been reported earlier (Kasanin and Hanfmann, July 1938, December 1938; Hanfmann and Kasanin 1937, 1941, 1942), this monograph presented primarily the qualitative aspects of their investigations.

Vygotsky's initial studies of schizophrenia led him to postulate, within the framework of his model, that this condition involved a loss of conceptual ability with resultant regression to a more primitive (complex phase) level of functioning (Vygotsky 1934, p. 1965).

Basically, Hanfmann and Kasanin substantiated Vygotsky's evaluation of his concept formation test as an advantageous instrument for the study of mental processes, particularly when abnormal (schizophrenic) patterns are evident. They confirmed Vygotsky's description of schizophrenic thought patterns in the test situation. However, Hanfmann and Kas-

anin concluded that some modifications of Vygotsky's theory were essential.

First, on the basis of our results we cannot maintain Vygotsky's dichotomy between conceptual and preconceptual, "primitive" thinking. We had to postulate at least three levels of thinking to do justice to the tremendous variety of approaches and methods that form a transition from the highest conceptual to the most primitive "complex" level of thinking. Secondly, the highest conceptual level of thinking, in the form in which it is required in the concept formation test, is not, as Vygotsky seems to assume, an uncontested possession of every normal adult. Our experiments have shown clearly that only the college educated group reaches this level as a whole.... The analysis of the case histories indicates furthermore that the impairment of thinking is more likely to be associated with some clinical pictures than with others (1942, p. 83-84).

Hanfmann and Kasanin (1942) divided total test performance into three phases, each comprised of a series of stages. The major phases were:

- (1) interpretation of the instructions by the subject,
- (2) initial attempts at solution, which consisted of forming groups and changing them in response to corrections, and
- (3) discovery of the correct solution and completion of the task.

From the variety of performances observed during the test situation, the authors distinguished three levels of performance:

- (1) a primitive level, characteristic of absence of conceptual thought
- (2) an intermediate level, characteristic of partial development of conceptual thought
- (3) a conceptual level, characteristic of fully developed conceptual thought.

These phases and levels of performance are incorporated in the following table summarizing Hanfmann and Kasanin's observations (1942, p. 55). (See page 33).

It is significant that, although Hanfmann and Kasanin were certainly aware of the existence of Vygotsky's later investigations and possibly had indications of his theoretical revisions, specific data was yet inaccessible. Hanfmann and Kasanin indicated that:

The description Vygotsky gives of the different stages in the evolution of the test performance during childhood partly corresponds to our description of the primitive, the intermediate, and the conceptual levels of performance. However, differences of technique and lack of exact data in Vygotsky's article reporting the results of the experiment made it impossible to compare the performance of our patients to that of children of different age levels... (1942, p. 90).

Vygotsky's later work, postulating three developmental phases of conceptual thought, supported Hanfmann and Kasanin's analysis of test performance levels.

TABLE I
SUMMARY OF HANFMANN'S AND KASANIN'S OBSERVATIONS RE:
THE CONCEPT FORMATION TEST

LEVELS OF PERFORMANCE	INTERPRETATION OF THE TASK	GROUPS CREATED IN THE PROCESS OF SOLUTION	FINDING AND MASTERING OF THE CORRECT SOLUTION
CONCEPTUAL	Task Seen as a Classification	Classes	Solution with Insight
INTERMEDIATE	The Required Struc- ture of Grouping Not Grasped (a) task seen as a game with rules (b) only one possi- bility of grouping seen	Collection Pseudo Classes	Solution with Partial Insight
PRIMITIVE	The Words Not Re- lated to the Properties of the Blocks (a) task seen as soluble only by trial and error (b) names of blocks disregarded	Physiognomic Groups Primitive Com- plexes Random Groups Individual Placements	Mechanical Solution No Insight

(Hanfmann and Kasanin 1942, p. 55)

Studies of Qualification

The Vygotsky Test as a measure of intelligence. Several studies have been conducted to assess the relationship of concept formation test performance to performance on tests of mental ability. C. Knight Aldrich (1944) investigated the relationship between the Vygotsky test and other measures of intelligence. His sample consisted of 53 post addicts (21-57 years), diagnosed as either psychopathic personality or demonstrating psychopathic tendencies, and 51 controls (23-55 years). The author found no significant difference between the groups in conceptual thinking as measured by the Vygotsky test. Aldrich suggested indications of a close relationship between characteristics measured by the Vygotsky and Wechsler-Bellevue tests. The correlation obtained between the Vygotsky performance score and the Wechsler-Bellevue full scale score exceeded most of the correlations between the subtest and full scale scores of the Wechsler-Bellevue (Aldrich 1944, p. 32). Only two subtests in ages 20-34 and four in ages 35-39 established a higher correlation; unfortunately, these were not specified by Aldrich.

TABLE II

CORRELATIONS BETWEEN VYGOTSKY CONCEPT
FORMATION TEST AND WECHSLER-BELLEVUE TEST

Wechsler-Bellevue	Vygotsky Concept Formation
Verbal Scale	0.63 $\pm$ 0.07
Performance Scale	0.66 $\pm$ 0.07
Full Scale	0.67 $\pm$ 0.66

(Aldrich 1944, p. 33)

Semeonoff and Laird (1952) calculated that the correlation between the Vygotsky test and intelligence as measured by the Progressive Matrices was 0.52 ± 0.05 , approximating Semeonoff's earlier [1944] correlations of 0.40 to 0.50. Semeonoff [1944] also obtained a correlation of 0.57 ± 0.04 between Vygotsky and Koh blocks (Trist-Misselbrook version) scores. Generally, Semeonoff and Laird (1952) concluded that, although the test score achieved was not independent of intelligence, the Vygotsky test could not be regarded as a suitable alternative to commonly accepted intelligence tests. However, the authors indicated that, for the study of "... the processes rather than the products of conceptual thinking ...," the test provided "... valuable or even indispensable supplementary material to the results of orthodox intelligence testing (Semeonoff and Laird 1952, p. 102)."

Penny (1951), noting the subjectivity of administering and interpreting the Vygotsky test, developed a new system of administration and scoring. He derived a uniform recording sheet and tabulation sheet whereby the examiner could classify test behavior in a more objective manner.

Following administration of the test to normal (44) and organic (7) subjects, Penny obtained a Pearson r of -0.45 re intelligence and Vygotsky test performance, using the Shipley Institute of Living Scale as a measure of intelligence. In contradiction to the findings of Semeonoff and Laird (1952) and Aldrich (1944), Penny concluded,

... there is no significant relationship between intelligence and the Vygotsky test performance, for this sample of subjects, using this revised form of administration and scoring (1955, p. 74-75).

However, Penny (1951, p. 75) qualified his findings as follows, " ... low correlations have been found because of the limited range of talent."

Although the negative correlation obtained in the Penny study opposed the findings of Semeonoff and Laird (1952) and Aldrich (1944), the authors remain in theoretical agreement.

The Vygotsky Test as a measure of conceptual thinking among children. The concept formation test has been incorporated

in several studies utilizing children as subjects. Jane Thompson (1941) designed a study of children's characteristic behavioral and verbal responses to establish whether qualitative differences in test performance existed between school children of different age levels. Thompson found that older children tended to form categories and to generalize about their categories; younger children tended to class objects belonging together in concrete situations or to say that no objects belonged together. She concluded that generalizing ability increased with the age of the child. Although test administration was modified, the Vygotsky test proved very difficult for children, apparently because it required mastery of a dual classificatory system.

Recently, Meece and Rosenblum (1965) employed the Vygotsky test, with some modification, to measure conceptual thinking among sixth grade children. The following modifications in test administration were instigated: no time limit was imposed for the first grouping; subsequently, clues were given at 5 minute intervals for 30 minutes, then at 3 minute intervals; questioning by the examiner was directive. Scoring was calculated on nine measures.

Meece and Rosenblum concluded that increased mental age resulted in greater ability to verbalize the major concept involved in the Vygotsky test, but did not increase the incidence of "mature" types of approaches to the task nor

minimize the amount of time or number of clues needed to complete the task successfully. Meece and Rosenblum (1965, p. 201) developed children's norms for the test, plus a formula for calculating mental age scores from test performance. They concluded that " ... in terms of averages at least, sixth grade girls perform very much like adults on the Vygotsky block test (Meece and Rosenblum 1965, p. 201). "

Both Thompson (1941) and Meece and Rosenblum (1965) substantiated Vygotsky's finding that the intellectual functions which underlie concept formation develop at puberty (See page 23).

The Vygotsky Test as a projective device. In separate studies, Rapaport (1942) and Aldrich (1944) utilized the Concept Formation Test in conjunction with the Rorschach. Rapaport noted that both tests exercised the organizing function of the subject but added, in differentiation, that the Vygotsky test was intrinsically an instrument for the observation of psychic procedure, the Rorschach for the extraction of psychic generalities.

Rapaport (1945, p. 464) suggested from his clinical observations that test performance was affected by several subject attributes: specifically flexibility, fluidity, persistence, and rigidity.

The Vygotsky Test in studies of thought patterns. E. O. Mil-

ler (1955) used this test to investigate patterns of thought in patients and college students, concentrating upon how the subjects dealt with the blocks. Following the presentation of case studies, she concluded

... that these blocks can be used effectively with the phenomenological point of view. We discover something of the individual frame of reference particularly in regard to the method of thinking This in itself will help in the use and interpretation of the more objective tests (Miller 1955, p. 89).

Miller concurred with Semeonoff and Laird's (1952) previous evaluation of the Vygotsky test as an effective supplementary instrument to intelligence testing.

Fosberg (1948), in a study of thought processes with subjects of superior educational attainment (post-graduate), proposed radical modifications of test administration. He abolished the single solution requirement and accepted all logically consistent solutions as correct. Fosberg terminated his study after discerning 50 such solutions but suggested that the possibilities were not yet exhausted. Fosberg justified his unique administration pragmatically in these terms,

In yielding these additional data, the new method increases the usefulness of the test, particularly in the study of higher thought processes (1948, p. 560).

Consideration of Fosberg's findings revealed two possible weaknesses in his study design. First, many subjects apparently employed predominantly perceptual rather than conceptual approaches to task solution. The blocks were considered as "objects" rather than as carriers of abstract properties (Hanfmann 1941, Hanfmann and Kasanin 1937). Secondly, the selection of "logically consistent solutions" was entirely subjective. Although the Fosberg pattern of administration seemed, at first, to lend itself to the study of flexibility and rigidity in task solution, no objective measure of this construct was accessible.

The Vygotsky Test in studies of rigidity. Fisher (1950) noted one common limitation in preceding studies of rigidity. Restricting these investigations to simple motor or perceptual factors precluded any empirical determination of either " ... how generalized rigidity may be in the individual personality, or whether there are distinctly different kinds of rigidity (Fisher 1950, p. 1)."

Fisher administered a battery of rigidity measures, including the Vygotsky Test of Concept Formation, to normal (20), paranoid (20), and hysteric (20) females. Total battery scores were related to Rorschach rigidity scores, indicated by restricted responses and limited use of color. He obtained a measure of personality maladjustment via clinically recognizable signs and administered Guilford's

S. T. D. C. R. to obtain " ... a uniform means of analyzing a subject's way of describing herself (Chown 1959, p. 208)."

Vygotsky test administration was substantially modified. Subjects were instructed to construct maximum numbers of classifications involving the blocks. Scoring was accomplished on quantitative (number of groupings)-qualitative (type of grouping) bases; a weighted scoring system was devised regarding the classifications employed.

Fisher concluded that

... the concept of general rigidity as a real entity is to a considerable degree fictitious and ... one should probably not anticipate more than very moderate success in attempting to measure such a variable (1950, p. 41).

Chown (1959, p. 208) criticized Fisher's study, asserting that his instruments measured "narrowness of outlook" rather than subject rigidity. She does not, however, specify the invalid instruments.

Forster, Vinacke, and Digman (1955) administered a battery consisting of the Vygotsky Test of Concept Formation, the Einstellung Test, a problems test, a sorting test, and a contour drawing test to 65 college freshmen. Subjects were designated rigid or flexible by performance on each measure. Correlations nullified the hypothesis that a general rigidity-flexibility factor was common to the measures

of behavior employed. Forster, Vinacke, and Digman concluded that

... a person who displays behavior defined as flexible in one situation does not necessarily do so in another (1955, p. 215).

Buss (1950, 1952, 1953a, 1953b) substantially modified the nature of the Vygotsky Test stimuli for his investigations of rigidity and conditioning. Specifically, Buss was interested in the effects of reinforcement and extinction on rigidity in a conceptual situation.

Buss (1952, p. 222) defined rigidity as the "... inability to learn a new discrimination in response to changing circumstances" or failure to shift to new discriminations. In his initial investigation, Buss studied changes in the degree of rigidity (measured by discrimination reversal ability) as a function of reinforcement schedules.

Buss instituted modifications in the Vygotsky material regarding height, form, and color, and employed a special apparatus (1950, p. 495) to present the stimuli and record subject responses (1950, 1952, 1953a).

From his studies of rigidity, Buss concluded:

(a) that the principles of extinction and reinforcement have utility in the study of rigidity in conceptual situations (1952, p.227).

(b) that nonreversal shift (substituting height discrimination for form discrimination) resulted in greater rigidity than reversal shift (reversing the positive-negative values of tall and short stimuli within a height discrimination) (1953a, p. 80).

(c) that absolute shift (a stimulus assigned negative value in two successive discriminations) resulted in greater rigidity than relational shift (positive and negative values of stimuli are reversed in successive discriminations) (1953b, p. 156).

Norman, Baker, and Doehring (1951) investigated the effect of rigidity on college achievement. The Vygotsky Test of Concept Formation, utilizing Rapaport administration and scoring, was employed as a measure of rigid thinking. Degree of rigidity was compared to academic achievement, based on grade point averages (G. P. A.), and intelligence, derived from A. C. E. These groups were distinguished:

N	A.C.E.	G.P.A
10	high	high
10	high	low
10	low	high
10	low	low

No significant difference in Vygotsky Test performance was established between the groups. The authors concluded " ... no evidence was found that rigidity, if such were measured, is related to either the G. P. A. or to the interac-

tion of the A. C. E. and the G. P. A. (Norman, Baker, Doebling 1951, p. 369)." Data was reviewed, isolating the time score as a rigidity index; differences were again insignificant. In conclusion, Norman, Baker, and Doebling questioned the validity of the Vygotsky Test of Concept Formation as a measure of rigid thinking.

None of the studies which have been considered employed the Vygotsky Test per se as a measure of rigidity. It is, rather, the analysis of Vygotsky Test performance or, more specifically, the method of administration and scoring utilized in the study which indicated the degree of rigidity in the subject's approach to the task.

Most scoring and administration procedures employed were derivatives of Hanfmann and Kasanin's method. The measure of rigidity obtained was contingent upon the length of time and number of clues involved in the test session, which is a dubious indication of rigidity. However, Penny's (1951) modifications of administration and scoring produce objective scores which correspond to Rapaport's (1945, p. 464-465) definitions of flexibility and rigidity in Vygotsky Test performance. Specific administration instructions are given in Appendix A; scoring procedures are given in Chapter IV, Scoring and Administration of the Vygotsky Test (p. 60)

PART III: INTEGRATION

This investigation incorporates theory and empirical data from two areas of psychological research, the nature of behavioral rigidity and processes of concept formation. This chapter included a review of the literature pertaining to rigidity. Specifically, two significant aspects were considered.

(i) Although the term "rigidity" is used extensively throughout psychological literature, a universally accepted definition of this behavior pattern apparently has not been produced. Divergent concepts may be acquired from the writings of Kounin (1944), Werner (1946), Cattell and Tiner (1949), and Buss (1952).

(ii) The literature distinguishes two bodies of research, regarding rigidity as either a generalized personality trait or a field specific factor.

The first assumption, exemplified by Pinard (1932), Rokeach (1948, 1949), and others, presents the idea of a general rigidity factor influencing every sphere of human behavior. Thus Rokeach concluded that

the rigidity inherent in the ethnocentric person's solution of social problems is not an isolated phenomenon but is rather an aspect of a general rigidity factor which will also manifest itself in the solution of any problem, be it social or non-social (1948, p. 259).

Recently, Rubenowitz hypothesized that "... the way a person behaves or thinks in one situation is not an isolated phenomenon within the personality, but rather an aspect of a general fundamental factor (1963, p. 230)." His study confirmed his original hypothesis, leading him to conclude that

in adults, a general factor of flexibility-rigidity can be identified, a factor which accounts for a considerable part of the variance in thinking, attitudes, and displayed behavior (Rubenowitz 1963, p. 232).

Although Rubenowitz essentially supported Rokeach's conception of the nature of rigidity, he differed in one significant aspect. Rubenowitz maintained that the effect of rigidity on personality was excluded from "intellectual problem solving."

We agree that many important aspects of cognitive functioning can be attributed to personality rather than to intelligence but we are not inclined to agree when he [Rokeach] includes intellectual problem solving among those aspects. According to our findings a person's ideological orientation may be clearly distinguished from his conceptual behavior in intellectual problem solving when emotions are not involved (Rubenowitz 1963, p. 237).

In contradiction to this concept of the nature of behavioral rigidity, a second theoretical body may be discriminated. Luchins (1949, 1951), Applezweig (1954), and others perceived rigidity, not as a generalized factor pervading the total personality, but as a construct unique to a spec-

ific task.

From the controversy regarding the existence of rigidity as a general personality factor as opposed to being a characteristic response to specific types of situations, the present study developed. The research was designed to examine whether individuals who are predominantly rigid in their social attitudes exhibit rigidity to a higher degree on a task requiring the formulation of a new concept, than subjects whose attitudes indicate low social rigidity. A measure of social rigidity was obtained by Gough-Sanford Rigidity Scale performance.

As the problem under investigation incorporated rigidity established on a non-social task, an additional instrument, the Vygotsky Test of Concept Formation, was administered. This instrument was employed in consideration of these research conditions:

(1) The study required an objective assessment of non-social rigidity, which may be obtained via Penny scores of Vygotsky Test performance.

(2) The study required a conceptual performance measure to investigate Rubenowitz's (1963, p. 237) specification that conceptual behavior is disjunct from personality effects.

Previous administrations of the Vygotsky Test provided opportunity for the observation that several subjects exhibited distinctly rigid patterns of performance according to Rapaport's definition (1945, p. 464). A review of the relevant literature dichotomizing the nature of rigidity as a constituent of personality gave impetus to this research.

Studies involving the Vygotsky Test have indicated that test performance may be modified by specific subject variables. Although level of intellectual functioning may be determined by test performance, intervening factors may alter the pattern of test performance. Rapaport (1945, p. 464) considered personality characteristics effectual determinants of task performance on Vygotsky Test. Thompson (1941) and Meece and Rosenblum (1965) supported Vygotsky's conclusion that true conceptual thought is practicable only at puberty.

Variability in test performance attributable to subject differences is an advantageous circumstance when data pertaining to the processes of concept formation, rather than indications of conceptual level, are serviceable. The validity of the test in any circumstances is dependent on the method of administration and scoring employed, subjecting the construct being investigated to objective measurement.

Several reviews of the Vygotsky test have been published (Pickford and Pickford, 1943; Rapaport, 1945; Hartman, 1947;

Zangwill, 1949). Although Western psychologists have instituted objective scoring systems to render essential data from test performances for analysis, the limited body of empirical research involving the Vygotsky Test indicates that its primary utility remains in the area of clinical rather than experimental psychology.

CHAPTER III

DEFINITIONS AND HYPOTHESIS

STUDY DEFINITIONS

Throughout this study, the following definitions were employed.

Social Rigidity

This construct was measured by the Gough-Sanford Rigidity Scale to determine the individual's degree of rigidity in social thinking. A Likert scale was utilized to establish the degree of agreement or disagreement between individual items (Rokeach, McGovney, Denny 1960, p. 185; Rubenowitz 1963, p. 83). Low scores were interpreted to indicate a low degree of social rigidity; high scores indicated a high degree of social rigidity. On the basis of these initial scores, the following groups were distinguished.

Maximal Group - those individuals who scored at least 1.75 standard deviations above the mean on the Gough-Sanford Rigidity Scale, exhibiting high social rigidity.

Equivocal Group - an equivalent number of individuals selected at random, whose scores lay between 1.75 standard deviations above and below the mean on the Gough-Sanford Rigidity Scale, exhibiting moderate social rigidity.

Minimal Group - those individuals who scored at least 1.75 standard deviations below the mean on the Gough-Sanford Rigidity Scale, exhibiting low social rigidity.

Non-Social Rigidity

This component was measured by the Vygotsky Test of Concept Formation, utilizing the Penny (1951) method of administration and scoring. Rapaport (1945) proposed the following definitions of conceptual rigidity and flexibility, in terms of performance on this test.

Non-social rigidity -

... the inability to discard an idea once conceived ... a resistance to, or rejection of, the implications -- in the form of clues -- for the modification or discarding of concepts (Rapaport 1945, p. 465).

Non-social flexibility -

... the ability to modify concepts once developed upon encountering difficulty or failure ... the capacity for delaying decision until sufficient relevant data is known ... the ability to work with more than one concept simultaneously without ... confounding them and becoming disorganized and directionless (Rapaport 1945, p. 464).

As rigidity and flexibility are considered as the extremes of a continuum, the term non-rigid as employed in the present study is synonymous to flexible.

HYPOTHESIS OF THE STUDY

The following hypothesis was investigated through the present study.

H₁: No significant difference exists among groups exhibiting high, moderate, and low rigidity on a measure of social behavior in formulating a new concept in a non-social context.

In terms of the instrument utilized, the trends regarding non-social rigidity were determined by the multiple versus single system difference and the rigidity per cent score (Penny 1951, p. 81). In this view, the following is stated:

A: No significant difference exists among the three groups in non-social rigidity as measured by the multiple versus single system difference.

B: No significant difference exists among the three groups in non-social rigidity as measured by the rigidity per cent score.

CHAPTER IV

EXPERIMENTAL PROCEDURE AND DESIGN

THE SAMPLE

The Gough-Sanford Rigidity Scale (Rokeach and Fruchter 1956; Fruchter, Rokeach, Novak 1958; Rokeach, McGovney, Denny 1960, p. 418) was administered to 779 students enrolled in Introductory Educational Psychology during the 1967-1968 winter session at the University of Alberta.

From the population, members of the following experimental groups were selected.

- (a) Maximal group - consisting of individuals who scored at least 1.75 standard deviations above the mean of Gough-Sanford Rigidity Scale distribution, exhibiting high social rigidity.
- (b) Equivocal group - consisting of an equivalent number of individuals selected at random who scored between 1.75 standard deviations above and below the mean of Gough-Sanford Rigidity Scale distribution, exhibiting moderate social rigidity.
- (c) Minimal group - consisting of individuals who scored at least 1.75 standard deviations below the mean of Gough-Sanford Rigidity Scale distri-

bution, exhibiting low social rigidity.

The distribution of scores on the Gough-Sanford Rigidity Scale, with calculated mean and standard deviation, is presented in Table III. Figure 1 illustrates the distribution of Gough-Sanford Rigidity Scale scores for the total population, plus distributions by sex.

The experimental sample contained 120 possible subjects; the testing sessions involved 90 actual subjects uniformly representing the three designated groups.

Freshmen students were utilized in this study to control two conditions significant to performance on the second instrument, the Vygotsky Test of Concept Formation.

(a) education: Hanfmann and Kasanin (1942, p. 90) concluded that performance on the concept formation test was related to educational attainment. All subjects in the study met a minimum educational requirement of twelve years of formal education.

(b) development: Vygotsky (1966, p. 58) concluded that the intellectual functions prerequisite to concept formation matured at puberty. Thompson (1941) and Meece and Rosenblum (1965) concurred with this finding. All subjects in the study met a basal age requirement of seventeen years.

TABLE III

DISTRIBUTION OF SCORES ON THE
GOUGH-SANFORD RIGIDITY SCALE IN THE TOTAL
POPULATION AND BY SEX

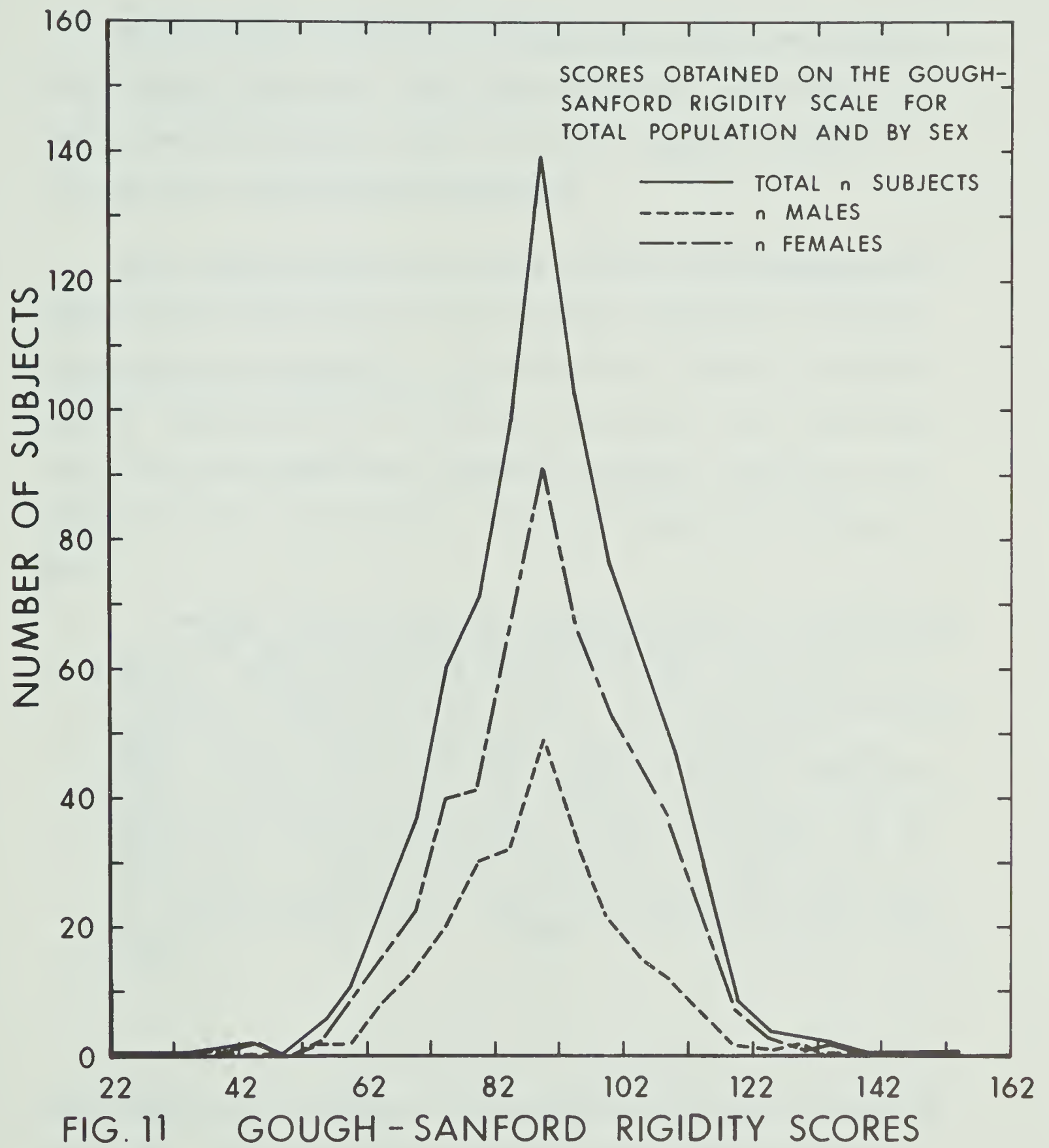
MARK RANGE	N (MALES)	N (FEMALES)	TOTAL N
22-26	0	0	0
27-31	0	0	0
32-36	0	0	0
37-41	1	0	1
42-46	0	2	2
47-51	0	0	0
52-56	2	2	4
57-61	2	8	10
62-66	8	15	23
67-71	13	22	35
72-76	20	40	60
77-81	30	41	71
82-86	32	65	97
87-91	49	91	140
92-96	35	67	102
97-101	22	55	77
102-106	16	46	62
107-111	12	36	48
112-116	7	22	29

TABLE III
(CONTINUED)

MARK RANGE	N (MALES)	N (FEMALES)	TOTAL N
117-121	2	7	9
122-126	1	3	4
127-131	2	1	3
132-136	0	2	2
137-141	0	0	0
142-146	0	0	0
147-151	0	0	0
152-156	0	0	0
TOTALS	254	525	779

MEAN 88.275

STANDARD DEVIATION 14.100



STUDY PROCEDURE

Gathering of the data entailed both group and individual testing sessions. The group sessions, employing the Gough-Sanford Rigidity Scale, involved seminar groups in Introductory Educational Psychology.

After group session data was scored and tabulated, and experimental subjects were designated, individual testing sessions were scheduled. All individual sessions, employing the Vygotsky Test of Concept Formation, were conducted under uniform conditions regarding examiner, setting, and administrative instructions. Instructions to the subject were:

"Here are 22 different looking blocks. Though they all LOOK different they can REALLY be sorted into four kinds. Each of these kinds has a name. This one (orange triangle Mur) is a Mur. (It is placed name upwards, in the Mur section of the sorting board.). The names of the others are Lags, Cevs, and Biks. Now, what I want you to do is to take the blocks ONE BY ONE and sort them into the four different groups. Don't turn the blocks up-side down because the names are underneath. I suggest that you start by picking out the Murs and putting them here, (Indicate the Mur section of the sorting board). After each move I'll tell you if you are right or not. Right, go ahead (Penny 1951, p.68).

No time limit was imposed on the subject. The subject was required to verbalize his attempt at solution following each move. This data was recorded on the Vygotsky Record Form (Appendix B) and transferred to the Vygotsky Profile Sheet (Appendix C).

At the conclusion of each individual session, the nature of the study was explained and the subject was requested to maintain the validity of subsequent testing sessions by not discussing the proceedings.

THE INSTRUMENTS

Two instruments were employed to obtain analogous measures of social and non-social rigidity from each subject.

Gough-Sanford Rigidity Scale

The Gough-Sanford Rigidity Scale was employed to measure rigidity in social thinking and behavior. Rubenowitz (1963, p. 83) described this instrument as "... a measure of resistance to change in single habits or sets." Rokeach (1960, p. 184) observed that the instrument is extensively used and also commented that it "... is now included in the California Psychological Inventory, where it is labelled F_x (Flexibility (1960, p. 418)).

The Gough-Sanford Rigidity Scale was administered, employing a Likert method of scaling, to approximate the investigations of Rokeach, McGovney, Denny (1960) and Rubenowitz (1963). The Gough-Sanford Rigidity Scale (Rokeach, McGovney, Denny 1960, p. 418) is presented in Appendix D.

A test reliability coefficient calculated on retests of 50 individuals selected at random from the total popula-

tion yielded a Pearson r of .76. (Appendix E).

Vygotsky Test of Concept Formation

The Vygotsky Test of Concept Formation material consists of twenty-two blocks, distinguished by five colors, six shapes, two heights (tall and flat), and two sizes of upper surface (large and small). Written on the underside of each block is one of four nonsense words (lag, bik, mur, cev). Regardless of the color or shape of the block, lag is written on all tall large figures, bik on all flat large figures, mur on all tall small ones, and cev on all flat small ones. The subject's task is to place these blocks into four classes.

The nature of the Vygotsky Test of Concept Formation has made a measure of reliability difficult to establish. Semeonoff and Trist (1958, p. 23), in administrations of a parallel form of the test devised by Laird, noted that behavior patterns on the two forms indicated "such consistency of approach" that diagnostic implications of reliability received support.

Scoring and administration of the Vygotsky Test. The method of administration and scoring developed by Penny (1951) was employed as it furnishes a measure of task approach rigidity. Alternate methods of scoring were considered but judged inappropriate to the requirements of this study (Hanfmann and Kasanin, 1937; Semeonoff and Laird, 1952; Semeonoff and Trist,

1958).

The Penny method of administration and scoring of the Vygotsky Test was chosen, as this system

- (1) reduces test administration time,
 - (2) systematizes the method of recording data,
 - (3) standardizes the test situation, and
 - (4) produces an exact subject performance record
- (Penny 1951, p. 65).

The Penny (1951) scoring system yields data on seven variables. Separate scores are obtained for each of the following components:

(1) the number of correct moves (those which are based on height and width, or height and surface area), denoted "CM";

(2) the number of clues given by the examiner, denoted "clues";

(3) the number of reversions (repetition of an incorrect move), denoted "Rev.";

(4) the difference of the number of "common" and "uncommon" systems of grouping used during the test, denoted "C:U: System Difference" -

(a) Common systems - those which are most frequently used (height, width, color, etc.),

(b) Uncommon systems - those which are not commonly utilized;

(5) the extent to which common and uncommon moves are employed, denoted "C:U Moves -Difference";

(6) the difference between the number of complex (multi-variable) and single system moves, denoted "Multiple versus Single System Difference";

(7) the rigidity per cent score (the per cent of moves according to the preferred incorrect system), denoted "R per cent".

Of the seven sources of data outlined above, two were significant to this study:

- (1) the multiple versus single system difference, and
- (2) the rigidity per cent score.

These two variables correspond to those characteristics of test performance which Rapaport described as indicative of (1) flexibility and (2) rigidity (Penny 1951, p. 81).

The Penny method of administration involves three sections. Parts II and III are required only if the subject has been unsuccessful in the preceding section. Detailed administration procedures are reproduced in Appendix A.

EXPERIMENTAL DESIGN

Subjects were assigned to experimental groups on the basis of scores obtained on the Gough-Sanford Rigidity Scale. Individuals who scored 1.75 standard deviations and above

on the Gough-Sanford Rigidity Scale were assigned to the maximal group. Individuals who scored 1.75 standard deviations and below on the Gough-Sanford Rigidity Scale were assigned to the minimal group. An equivalent number of individuals selected at random who scored between 1.75 standard deviations above and below the mean on the Gough-Sanford Rigidity Scale were assigned to the equivocal group.

An analysis of variance was performed to test for significant differences among the three groups. A parametric measure was selected as "... that test will be more powerful than any other in rejecting H_0 when it is false (Siegel 1956, p. 19)." The utility of the analysis of variance model is noted by Winer (1962, p. 47). An analysis of variance was therefore considered appropriate to determine whether the observed differences were significant.

The following assumptions underlie the use of the analysis of variance model.

Assumption 1: ... the distribution of the variables in the population from which the samples are drawn are normal (Ferguson 1966, p. 294).

Assumption 2: ... the variances in the populations from which the samples are drawn are equal. This is known as homogeneity of variance (Ferguson 1966, p. 294).

Assumption 3: ... the effects of various factors on the total variation are additive... (Ferguson 1966, p. 294).

Assumption 4: ... the observations must be independent (Ferguson 1966, p. 294).

Assumption 5: ... variables involved must have been measured in at least an interval scale, so that it is possible to use the operations of arithmetic ... on the scores (Siegel 1956, p. 19).

Ferguson (1966, p. 295) commented that, "With most sets of real data the assumptions underlying the analysis of variance are at best only roughly satisfied." He added that

... reasonable departures from the assumptions of normality and homogeneity may occur without seriously affecting the validity of the inferences drawn from the data (Ferguson 1966, p. 295).

Similarly, Winer (1962, p. 93) stated that " ... F tests are robust with respect to departures from homogeneity of variance ...," therefore " ... the experimenter need be concerned about only relatively large departures from the hypothesis of equal population variances."

The structural model for single factor experiments, described as Model I (Winer 1962, p. 56-62) or the fixed constants model, imposes the additional assumption that in-

ferences can be made only with respect to the classifications utilized in the investigation.

Scheffe (1959, p. 71), considers the F test a statistical technique to establish whether any differences significant from zero exist in the observed data. A significant F test indicates the existence of real differences between cell totals (n's being equal) or between cell means (n's being unequal).

The Newman-Kuels procedure (Winer 1962, p. 80) is utilized to test the significance of differences of means between groups after a significant overall F.

The Hartley test for homogeneity of variance (re Assumption 2) was performed to test the hypothesis

$$\sigma_1^2 = \sigma_2^2 = \sigma_k^2$$

via the statistic

$$F_{MAX} = \frac{\text{largest of } k \text{ treatment variances}}{\text{smallest of } k \text{ treatment variances}}$$

The parametrics associated with this distribution are k, number of groups, and n-1, the degrees of freedom for each treatment variance (Winer 1962, p. 93). When the observed F_{MAX} is greater than the tabled value associated with the selected α level, the hypothesis of homogeneity of variance is rejected.

Regarding the analysis of variance model, Assumptions 2, 3, and 4 were met. Although the experimental groups established by a predetermined criteria for group membership did not constitute a normal distribution (Assumption 1), the original population scores indicated such a distribution (See page 57, Figure 1). Assuming that a constant difference exists between units of measurement on the rigidity per cent scale, or that it has "interval scale characteristics," Assumption 5 was considered satisfied (Siegel 1956, p. 26-27).

CHAPTER V

ANALYSIS OF THE DATA

The following chapter consists of two sections. Part I presents the analysis performed on the multiple versus single system difference scores; Part II presents the analysis performed on the rigidity per cent scores. A one-way analysis of variance (Winer 1962, p. 56) was performed to test for significant differences among the maximal, equivocal, and minimal groups regarding each score.

PART I: ANALYSIS OF MULTIPLE VERSUS SINGLE SYSTEM DIFFERENCE SCORES

Test for Homogeneity of Variance in Multiple versus Single System Difference Scores

A Hartley test for homogeneity of variance (Winer 1962, p. 93) was performed on the variances obtained on the multiple versus single system difference scores. The variances are presented in Table IV.

TABLE IV

VARIANCES FOR MULTIPLE VERSUS SINGLE SYSTEM DIFFERENCE SCORES

MAXIMAL	EQUIVOCAL	MINIMAL
64.25	50.51	102.27

Appropriate values were substituted in the following formula.

$$F_{MAX} = \frac{S^2_{\text{largest}}}{S^2_{\text{smallest}}}$$

$$F_{MAX} = \frac{102.27}{50.51}$$

$$F_{MAX} = 2.02$$

The critical value of F_{MAX} was found to be 2.46 at the .05 level, where $k = 3$ and $df = 29$. The calculated F_{MAX} of 2.02 does not exceed the critical value at the .05 level of significance, substantiating the assumption of homogeneity of variance among multiple versus single system difference scores.

Test for Significant Difference of Means for Multiple versus Single System Difference Scores

Means and standard deviations for the multiple versus single system difference scores of the three groups are presented in Table V.

The analysis of variance for multiple versus single system difference scores is summarized in Table VI. No significant differences were found among the maximal, equivocal, and minimal group scores at the .05 level of significance.

As the F - ratio did not attain significance, testing of differences between pairs of means was not performed.

TABLE V

MEANS AND STANDARD DEVIATIONS FOR MULTIPLE VERSUS SINGLE SYSTEM DIFFERENCE SCORES			
	MAXIMAL	EQUIVOCAL	MINIMAL
MEANS	22.40	25.33	22.73
STANDARD DEVIATIONS	8.02	7.11	10.11
	N = 30	N = 30	N = 30

TABLE VI

SUMMARY OF ANALYSIS OF VARIANCE FOR MULTIPLE VERSUS SINGLE SYSTEM DIFFERENCE SCORES				
SOURCE	S. S.	d. f.	M. S.	F
BETWEEN GROUPS	154.76	2	77.38	1.07
EXPERIMENTAL ERROR	6293.73	87	72.34	
TOTAL	6448.49	89		

$$F_{.95} (2, 87) = 3.12$$

PART II: ANALYSIS OF RIGIDITY PER CENT SCORES

Test for Homogeneity of Variance in Rigidity Per Cent Scores

A Hartley test for homogeneity of variance (Winer 1962, p. 93) was performed on the variances obtained on the rigidity per cent scores. The variances are presented in Table VII.

TABLE VII

VARIANCES

FOR RIGIDITY PER CENT SCORES

MAXIMAL	EQUIVOCAL	MINIMAL
58.75	54.65	113.06

Appropriate values were substituted in the following formula.

$$F_{MAX} = \frac{S^2_{largest}}{S^2_{smallest}}$$

$$F_{MAX} = \frac{113.06}{54.65}$$

$$F_{MAX} = 2.07$$

The critical value of F_{MAX} was found to be 2.46 at the .05 level, where $k = 3$ and $df = 29$. The calculated F_{MAX} of 2.07 does not exceed the critical value at the .05 level of significance, substantiating the assumption of homogeneity of variance among rigidity per cent scores.

Test for Significant Difference of Means for Rigidity Per Cent Scores

Means and standard deviations for the rigidity per cent scores of the three groups are presented in Table VIII.

The analysis of variance for rigidity per cent scores is summarized in Table IX. No significant differences were found among the maximal, equivocal, and minimal group scores at the .05 level of significance.

Since the F - ratio did not attain significance, testing of differences between pairs of means was not performed.

TABLE VIII

MEANS AND STANDARD DEVIATIONS
FOR RIGIDITY PER CENT SCORES

	MAXIMAL	EQUIVOCAL	MINIMAL
MEANS	16.99	13.99	18.58
STANDARD DEVIATIONS	7.47	7.39	10.63
	N = 30	N = 30	N = 30

TABLE IX
SUMMARY OF ANALYSIS OF VARIANCE
FOR RIGIDITY PER CENT SCORES

SOURCE	SS	d. f.	M. S.	F
BETWEEN GROUPS	326.09	2	163.05	2.19
EXPERIMENTAL ERROR	6480.28	87	74.49	
TOTAL	6806.37	89		

$$F_{.95} (2, 87) = 3.12$$

CONCLUSION

Analysis of the data indicated that no significant difference existed among the three group means regarding either multiple versus single system difference scores or rigidity per cent scores. This conclusion implies that, in terms of the measures employed in the study, no significant relationship existed between social and non-social rigidity.

CHAPTER VI

DISCUSSION AND IMPLICATIONS

SUMMARY OF THE STUDY

The objective of the present study was to investigate whether subjects exhibited a general rigidity performance on both social and non-social measures of behavior. Specifically, the subject's degree of rigidity was established on a social behavior scale and related to his pattern of performance on an objective test of concept formation.

Following administration of the Gough-Sanford Rigidity Scale to freshmen students enrolled in Introductory Educational Psychology at the University of Alberta, the following groups were distinguished.

- (a) Maximal group - consisting of individuals who scored at least 1.75 standard deviations above the mean of Gough-Sanford Rigidity Scale distribution, exhibiting high social rigidity.
- (b) Equivocal group - consisting of an equivalent number of individuals selected at random who scored between 1.75 standard deviations above and below the mean of Gough-Sanford Rigidity Scale distribution, exhibiting moderate social rigidity.

- (c) Minimal group - consisting of individuals who scored at least 1.75 standard deviations below the mean of Gough-Sanford Rigidity Scale distribution, exhibiting low social rigidity.

Each group consisted of 30 subjects, to whom the Vygotsky Test of Concept Formation was administered individually. Using the Penny technique of administration and scoring, a multiple versus single system score and a rigidity per cent score were obtained for each subject.

The hypotheses of the study were:

- A: No significant difference exists among the three groups in non-social rigidity as measured by the multiple versus single system difference.
- B: No significant difference exists among the three groups in non-social rigidity as measured by the rigidity per cent score.

A one-way analysis of variance was conducted on the data pertaining to each measure to test for overt differences among the three experimental groups. No significant difference among the groups was established for either variable at the 0.05 level of significance. The hypothesis that groups differentiated on the basis of a measure of rigidity in social attitudes would not differ in specific aspects of

their performance on a test of concept formation received empirical support in this study.

DISCUSSION OF THE RESULTS

Confirmation of this hypothesis disposes one to support Goodstein (1953), Applezweig (1954), Schaie (1955), Wolpert (1955), and French (1955) in their contention that rigidity does not influence all areas of an individual's behavior. Although one cannot conclude that a generalized rigidity factor does not exist, there was, within this study, no evidence that social rigidity necessarily influences conceptual behavior. Although the initial rigidity measure incorporated a diversified sampling of social behaviors, purely intellectual activities appeared relatively unaffected by social attitudes. The results of this study are in agreement with Rubenowitz's statement regarding the nature of rigidity.

... the flexibility-rigidity factor is of a more emotional than intellectual character.

This leads to the conclusion that the flexibility factor may be at work when the intelligence factor is not, that purely intellectual manifestations can be found independently of flexibility-rigidity, and that the two factors may interact (Rubenowitz 1963, p. 234).

Two measures of non-social rigidity were employed in the present study. A negative multiple versus single system difference score was interpreted as an indication of rigidity as defined by Rapaport (Penny 1951, p. 81). How-

ever, the rigidity per cent score " ... expresses the extent of rigidity rather than its mere presence (Penny 1951, p. 81)." The aspect of rigidity measured by the rigidity per cent score appears to be similar to both Werner's (1946, p. 43) interpretation of functional rigidity and Cattell and Tiner's (1949, p. 322) definition of "structural" rigidity. This measure of rigidity also appears to be related in some aspects to Goldstein's (1943, p. 214) description of secondary rigidity applied to a normal population. Goldstein observed that a subject preferred making an incorrect response rather than failing to respond. This statement seems relevant to the observation, within the present study, that the rigidity per cent score approached significance at the 0.10 level whereas the multiple versus single system difference score remained non-significant. This disparity between the significance of the indication of rigidity and the extent of rigidity may be attributed to the subject's desire to respond in the test situation rather than to rigidity as a behavior pattern.

IMPLICATIONS FOR FURTHER RESEARCH

The review of the literature pertaining to the Vygotsky Test of Concept Formation indicated that, although norms exist for this instrument regarding intelligence (Semeonoff and Trist, 1958) and conceptual thinking among children (Meece and Rosenblum, 1965), norms with respect

to flexibility-rigidity are lacking. Norming data using the Penny method of administration and scoring would increase the utility of this instrument in psychological research.

Rokeach (1948) utilized the Einstellung experiment, commonly a set task, as a measure of rigidity. Recently, Soviet publications have reported extensive research being conducted on the psychology of set as conceived by Uznadze (1966). The comparability of Soviet and Western approaches regarding set could be investigated, employing the Vygotsky Test of Concept Formation, the Einstellung experiment, and Uznadze's set tasks (Hertzog, 1967) to examine three aspects of conceptual rigidity.

Hanfmann and Kasanin (1942) considered level of education an important variable in Vygotsky Test of Concept Formation performance. However, this statement is questionable as their population was substantially abnormal, therefore representing a limited range of educational achievement. Of greater reliability would be a time-lapse study, utilizing the research population in a retest following further educational attainment. The parallel form of the Vygotsky Test of Concept Formation, devised by Laird, might be incorporated in the retest.

Penny (1951) noted that age affected the rigidity pro-

file of his subjects based on Vygotsky test performance. However, he modified the results of his study by suggesting that an abnormal population contributed a limited 'range of talent' rather than a normal distribution. Further investigations might be conducted employing a wide range of subjects, both normal and abnormal, of various age levels.

Although the Vygotsky Test of Concept Formation was considered as a measure of rigidity within the scope of the present study, it remains essentially a test of concept formation. The obvious similarities between Piagetian stages and the phases of conceptual development delineated by Vygotsky, both of which culminate in the attainment of abstract thought, suggest the possibility of comparative studies in regard to both the theories and tasks of conceptual development proposed by Piaget and Vygotsky.

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APPENDIX A

PENNY METHOD OF ADMINISTRATION

There are three PARTS to the administration procedure for the Vygotsky Test; if a subject is able to complete PART 1 it is assumed that he would have been able to complete PART 2 and 3. If PART 1 is 'failed' then PART 2 is attempted; if PART 2 is failed also then PART 3 is attempted.

Part 1

(a) Spread the 22 blocks (with 'names' downwards) before the subject in front of the sorting board. The blocks should be about equal distance from each other and randomly distributed.

The 'sorting board' is simply a piece of cardboard 6" X 20" divided into four 5" X 6" sections. The four nonsense syllables LAG, CEV, BIK, MUR are printed on these sections.

(b) Say to the subject, placing emphasis on the words printed in capital letters:

'Here are 22 different looking blocks. Though they all LOOK different they can REALLY be sorted into four different kinds. Each of these kinds has a name. This one (orange triangular Mur) is a Mur. (Place it, name upwards, in the Mur section of the sorting board.) The names of the others are Lags, Cevs, and Biks. Now, what I want you to do is to take

the blocks ONE BY ONE and sort them into the four different groups. Don't turn the blocks up-side-down because the names are underneath. I suggest that you start by picking out the Murs and putting them here. (Indicate the Mur section of the sorting board.) After each move I'll tell you if you are right or not (make sure subject understands but do not give any clues, answers to leading questions, or analogies. Instructions may be repeated if required.) Right, go ahead.'

(c) Note relevant test behaviour prior to first move, for example, preliminary sorting of the blocks into colour groups. Note similar behaviour throughout test.

(d) Ascertain the subject's sorting system (whether by Form, Colour, Height, etc.) after each move. Enter the appropriate symbol(s) on the Record Form.

(e) If the subject sorts correctly and gives correct reason say: 'That's right'.

(f) If the subject sorts correctly but gives wrong reason say 'That's in its right place, but you have given me the wrong reason.' If two consecutive moves are 'right' for the same 'wrong' reason then indicate why the reasoning is faulty. For example, if Height is used as the sorting system for two consecutive moves in the Bik section,

then draw attention to the fact that the Cevs are also the same height.

(g) If the subject sorts incorrectly, ascertain his system and move the block, name upwards, to the correct section of the board saying: 'That's not right because it's a' (giving the correct name of the block.) These corrections are regarded as 'clues' and should be appropriately indicated on the Record Form.

(h) Continue until all blocks have been sorted.

(i) Test is regarded as 'solved' if five or more of the last moves are according to the correct system. If less than five moves are correct then repeat the test according to the following procedure:

(i) Turn all blocks name downward. Randomize them. Place as they were placed prior to the commencement of the test proper.

(ii) Say to the subject 'Now, just to make sure that you've got it right, I want you to try and put the blocks into their four groups just as they were before I mixed them up'.

(iii) No clues to be given.

(iv) The subject is not penalised for confusing the names of the groups so long as the members of the four groups are correct.

(j) If the test is still 'failed' then proceed to PART 2 of the procedure.

Part 2

(a) N. B. PART 2 should not be attempted before PART 1.

(b) The 22 blocks are grouped according to the correct principle, names downwards. The principle is explained to the subject in the following manner: 'These are the tall, wide ones (indicating the Lags but not referring to them by name); these are the tall, narrow ones (the Murs); these are the flat, wide ones (the Biks); and these are the flat, narrow ones' (the Cevs).

(c) Allow the subject to look at the blocks for approximately 15 seconds.

(d) Say to subject: 'Now I'm going to mix them up and when I have finished I want you to put them into their groups JUST AS THEY ARE NOW'.

(e) Randomize the blocks slowly.

(f) Say to subject: 'Right, go ahead.'

(g) For adequate performance the blocks must be grouped 100 per cent correctly. No clues are to be given. Record relevant test behaviour and the number and type of errors if his performance is adequate.

(h) If the subject fails on this section of the test then proceed to PART 3 administration.

Part 3

(a) N. B. PART 3 should not be attempted before PART 2.

(b) The blocks are placed in random order in front of the subject. The sorting board is removed.

(c) Say to subject: 'I'll show you another way that it can be done'. (Separate the blocks into five groups according to colour. Do not refer to 'Color').

(d) Allow subject to look at the blocks for approximately 15 seconds.

(e) Say to subject: 'Now I'm going to mix them up and when I have finished I want you to put them into the five groups JUST AS THEY ARE NOW'.

(f) Randomize the blocks slowly.

(g) Say to the subject: 'Right, go ahead.'

(h) As for (g) in PART 2.

(i) If the subject fails on this section of the test then bring the test situation to a close. If he succeeds then proceed as follows. Say to the subject: 'Now I'll show you another way it can be done.' (Separate the blocks into six groups according to Form. Do not refer to 'form' or

'shape' etc).

(j) As for (d), (e), (f), (g) and (h) above except that 'six' is substituted for 'five' in (e).

(k) If the subject fails on this section of the test then bring the test situation to a close. If he succeeds then proceed with:

- (i) Height - 2 groups
- (ii) Width -- 2 groups
- (iii) Height and Width combined - the 'correct' system
-- 4 groups.

Procedure is the same except for the necessary alterations to (c) and (e) above.

APPENDIX B

VYGOTSKY RECORD SHEET

Name :

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Age :

Sex :

Date :

Move No.	System	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		

APPENDIX C

VYGOTSKY
TABULATION SHEET

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Name:

Age:

Sex:

Date:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
H																					
W																					
Sa																					
F																					
C																					
V																					

REVERSIONS

CLUES

CM

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
f																					
M																					
E																					
?																					
M _F																					
P																					
M _f																					

M:S

C:U MOVES

C:U SYSTEM

R PER CENT

APPENDIX D

INSTRUCTIONS

THE GOUGH-SANFORD RIGIDITY SCALE

The following is a study of what the general public thinks and feels about a number of important social and personal questions. The best answer to each statement below is your PERSONAL OPINION. We have tried to cover many different and opposing points of view; you may find yourself agreeing strongly with some of the statements, disagreeing just as strongly with others and perhaps uncertain about others; whether you agree or disagree with any statement, you can be sure that many people feel the same as you do.

On the Answer Sheet -- Mark each statement according to how much you agree or disagree with it. Please mark every one. Circle +1, +2, +3, or -1, -2, -3, depending on how you feel in each case.

- +1: I agree a little.
- +2: I agree on the whole.
- +3: I agree very much.
- 1: I disagree a little.
- 2: I disagree on the whole.
- 3: I disagree very much.

THE GOUGH-SANFORD RIGIDITY SCALE

1. I am often the last one to give up trying to do a thing.
2. There is usually only one best way to solve most problems.
3. I prefer work that requires a great deal of attention to detail.
4. I often become so wrapped up in something I am doing that I find it difficult to turn my attention to other matters.
5. I dislike to change my plans in the midst of an undertaking.
6. I never miss going to church.
7. I usually maintain my own opinions even though many other people may have a different point of view.
8. I find it easy to stick to a certain schedule, once I have started it.
9. I do not enjoy having to adapt myself to new and unusual situations.
10. I prefer to stop and think before I act even on trifling matters.
11. I try to follow a program of life based on duty.
12. I usually find that my own way of attacking a problem is best, even though it doesn't always seem to work in the beginning.

13. I am a methodical person in whatever I do.
14. I think it is usually wise to do things in a conventional way.
15. I always finish tasks I start, even if they are not very important.
16. I often find myself thinking of the same tunes or phrases for days at a time.
17. I have a work and study schedule which I follow carefully.
18. I usually check more than once to be sure that I have locked a door, put out the light, or something of the sort.
19. I have never done anything dangerous for the thrill of it.
20. I believe that promptness is a very important personality characteristic.
21. I am always careful about my manner of dress.
22. I always put on and take off my clothes in the same order.

GOUGH-SANFORD RIGIDITY SCALE SCORE SHEET

1. -3 -2 -1 +1 +2 +3	12. -3 -2 -1 +1 +2 +3
2. -3 -2 -1 +1 +2 +3	13. -3 -2 -1 +1 +2 +3
3. -3 -2 -1 +1 +2 +3	14. -3 -2 -1 +1 +2 +3
4. -3 -2 -1 +1 +2 +3	15. -3 -2 -1 +1 +2 +3
5. -3 -2 -1 +1 +2 +3	16. -3 -2 -1 +1 +2 +3
6. -3 -2 -1 +1 +2 +3	17. -3 -2 -1 +1 +2 +3
7. -3 -2 -1 +1 +2 +3	18. -3 -2 -1 +1 +2 +3
8. -3 -2 -1 +1 +2 +3	19. -3 -2 -1 +1 +2 +3
9. -3 -2 -1 +1 +2 +3	20. -3 -2 -1 +1 +2 +3
10. -3 -2 -1 +1 +2 +3	21. -3 -2 -1 +1 +2 +3
11. -3 -2 -1 +1 +2 +3	22. -3 -2 -1 +1 +2 +3

APPENDIX E

RAW DATA UTILIZED IN CALCULATING
RELIABILITY OF GOUGH-SANFORD RIGIDITY SCALE

SUBJECT	INITIAL TEST	RETEST
1	112	105
2	98	111
3	90	94
4	96	85
5	79	76
6	119	105
7	113	126
8	124	116
9	117	122
10	74	89
11	79	84
12	79	82
13	75	82
14	71	78
15	71	74
16	68	66
17	68	74
18	108	77
19	106	104
20	96	102
21	100	114
22	104	96
23	103	119
24	102	94
25	82	89
26	81	87
27	79	81
28	102	100
29	112	103
30	110	96
31	86	93
32	94	89
33	94	92
34	93	79
35	93	107
36	93	89
37	93	88
38	92	86
39	92	87
40	92	94

(CONTINUED)

SUBJECT	INITIAL TEST	RETEST
41	92	89
42	91	84
43	89	83
44	88	91
45	88	100
46	87	86
47	87	84
48	86	81
49	86	91
50	83	91
MEAN	92.34	92.30
STANDARD DEVIATION	13.29	12.98
Pearson $r = 0.76$		

APPENDIX F

RAW DATA FOR MAXIMAL GROUP

SUBJECT	GOUGH-SANFORD RIGIDITY SCORES	MULTIPLE VERSUS SINGLE SYSTEM* SCORE	RIGIDITY PER CENT SCORE
1	113	16	19.048
2	113	20	23.810
3	113	19	23.810
4	114	12	23.810
5	114	35	9.524
6	114	29	9.524
7	114	34	4.762
8	114	20	14.381
9	115	25	9.524
10	115	24	9.524
11	115	29	14.081
12	115	25	19.048
13	115	28	9.524
14	115	25	23.810
15	115	28	14.381
16	116	15	28.571
17	116	33	9.524
18	117	11	28.571
19	119	11	19.048
20	119	31	14.381
21	120	20	23.810
22	121	21	14.381
23	122	25	9.524
24	123	4	28.571
25	124	26	9.524
26	124	12	33.333
27	127	28	14.381
28	128	10	19.048
29	133	29	9.524
30	135	27	19.048

* A constant of 20 has been added to each value to eliminate negative quantities.

APPENDIX G

RAW DATA FOR EQUIVOCAL GROUP

SUBJECT	GOUGH-SANFORD RIGIDITY SCORES	MULTIPLE VERSUS SINGLE SYSTEM* SCORE	RIGIDITY PER CENT SCORE
1	68	29	9.524
2	70	32	14.381
3	72	28	28.571
4	74	26	9.524
5	76	16	23.810
6	79	30	4.762
7	80	29	4.762
8	81	29	9.524
9	83	33	14.381
10	85	25	19.048
11	86	29	19.048
12	87	27	9.524
13	88	22	14.381
14	88	26	9.524
15	89	28	9.524
16	90	15	19.048
17	91	26	14.381
18	92	35	4.762
19	93	36	9.524
20	94	31	4.762
21	95	13	19.048
22	96	27	14.381
23	97	28	9.524
24	99	29	9.524
25	100	25	14.381
26	101	5	38.095
27	103	20	14.381
28	106	19	19.048
29	108	13	19.048
30	110	29	9.524

* A constant of 20 has been added to each value to eliminate negative quantities.

APPENDIX H

RAW DATA FOR MINIMAL GROUP

SUBJECT	GOUGH-SANFORD RIGIDITY SCORES	MULTIPLE VERSUS SINGLE SYSTEM* SCORE	RIGIDITY PER CENT SCORE
1	38	12	42.857
2	46	16	19.048
3	55	29	9.524
4	56	15	33.333
5	56	26	19.068
6	58	32	9.324
7	58	21	38.095
8	58	37	4.762
9	59	26	14.381
10	60	3	33.333
11	60	23	19.048
12	60	37	4.762
13	60	4	23.810
14	61	39	4.762
15	62	27	9.524
16	62	28	9.524
17	63	28	19.048
18	63	11	19.048
19	63	17	28.571
20	63	31	9.524
21	63	30	19.048
22	63	31	9.524
23	63	27	14.381
24	63	7	33.333
25	64	25	14.381
26	64	12	19.048
27	64	6	33.333
28	64	26	19.048
29	64	31	4.762
30	64	25	19.048

* A constant of 20 has been added to each value to eliminate negative quantities.

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